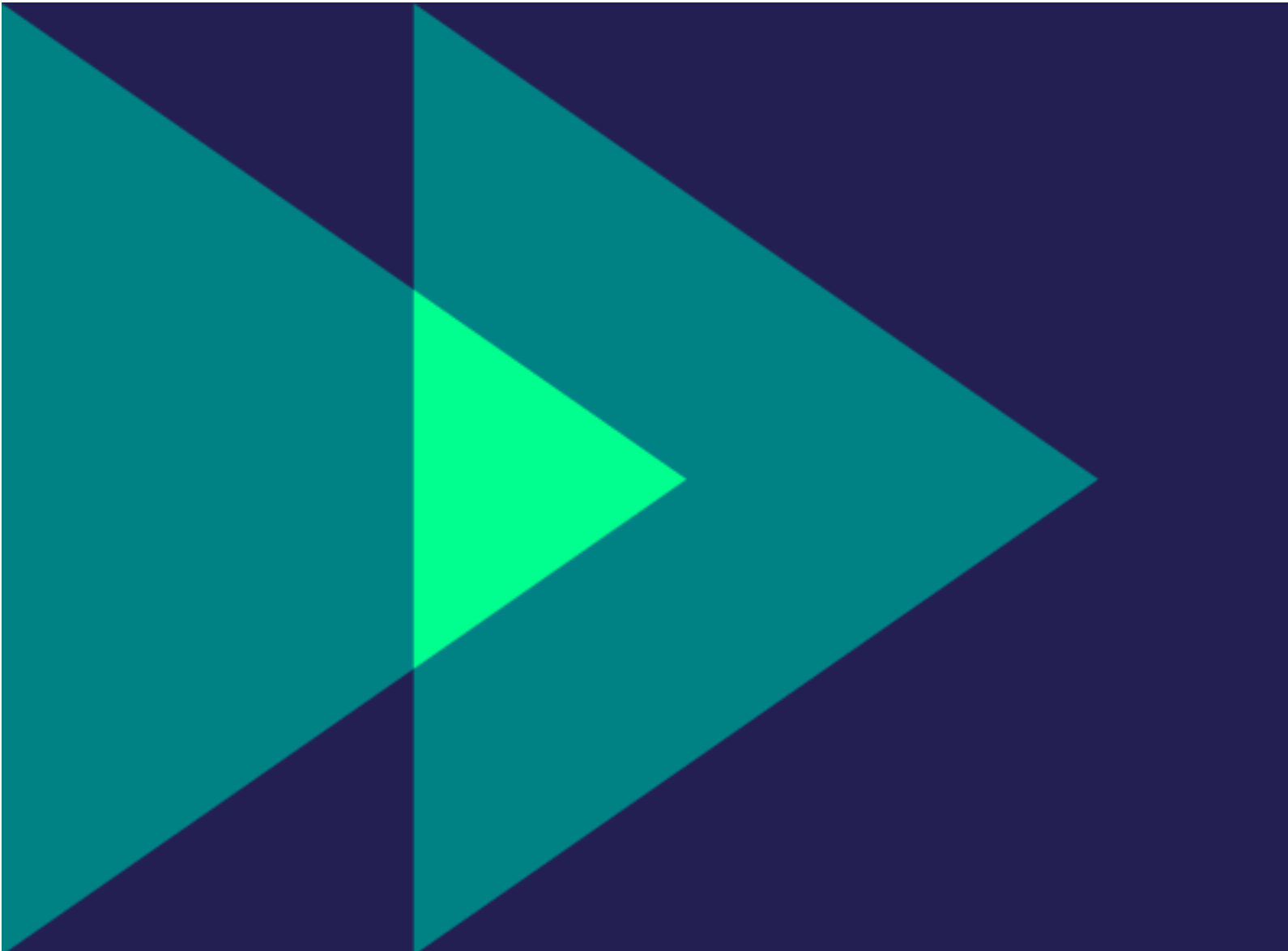


VALIDATION REPORT

kiutra GmbH

2022 - 415



Contents

Details of the validation process	2
Colofon	2
Introduction and definitions	4
Valid	4
Positive	4
Significant	4
Impact story	5
COOLING THE WORLD WITH INNOVATIVE CRYOGENICS	5
Climate Impact Forecast and Validation result	6

Details of the validation process

	Validation request	First review	Feedback call	Hand-in revisions	Final review	Wrap-up call
Date	29/03/2022	03/04/2022	25/04/22	19/05/22	22/05/22	31/05/22
Result	PLAUSIBLE, UNCLEAR AND SIGNIFICANT			VALID, POSITIVE AND SIGNIFICANT		

Colofon

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Project name: kiutra GmbH
Project CIF lead: Tomek Schulz
Validation ID: SL415
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Rapid Acceleration of Climate Entrepreneurs - RACE program 2022

This Validation Report, and the supporting training, coaching, and validation services that have been provided to this SME by Impact Forecast have been funded by the European Innovation Council as part of the RACE program initiated by EIT Climate KIC.

The RACE program supports EIC early-stage beneficiaries that have ground-breaking climate innovations, as well as those teams committed to bringing new climate-positive products and businesses to the market, to improve their market uptake.

The aim of the program is to support and help innovators to measure, improve and scale positive climate impact. By introducing the notion of emissions forecasting or climate impact projections alongside third-party validations, accelerating Market Uptake of climate innovations, and fast-track access to EIC Accelerator funding.

Introduction and definitions

This Validation report documents the Validation of a Climate Impact Forecast:

Validation is a review process performed by an impartial impact expert to determine if a CIF is Valid, Positive and Significant.

The **Validation process** usually takes two weeks and includes a first review, a first feedback call between the team and validator, time for revisions if needed, a final review and a final results call. For a detailed description see www.impact-forecast.com/cif-validations

The **review** comprises a structured check using our CIF Validation tool, a sensitivity analysis and the writing of an Impact story. CIF trainers with LCA expertise are trained to perform this process in a uniform and objective way.

CIF Validations are made on the request of the project team, and possibly commissioned by an impact organisation. The results are used by teams and organisations to compare and communicate the climate impact of projects.

A **Climate Impact Forecast** or CIF is an LCA based calculation of the GHG reduction or climate adaptation potential of a project. Using our CIF tool, the project team found the net climate impact of the key differences between business as usual and their innovative solution.

The **Impact data** in this report, and in CIF in general, is calculated with information from the project team and from the CIF tool. Technical details, amounts and assumptions in the calculation are provided by the project team. Impact factors (LCI data), impact equivalents and the calculation itself are provided by the CIF tool.

The **CIF tool** is used by teams to improve their impact and support design and business decisions with impact data.

CIF results are the project's potential or actual avoided emissions in tCO₂eq.

Every CIF Validation result consists of three independent outcomes:

Valid

A CIF is valid if it is representative of the project, using appropriate data and well justified assumptions. Therefore, the CIF and its results are representative of the potential for the project to mitigate, enable or adapt to climate change.

Detailed requirements for validity are specified on www.impact-forecast.com/cif-validations. A CIF can be Valid, Plausible, Improbable and Invalid.

Positive

A CIF is positive when it shows that the project has a lower climate impact than business as usual, or improved climate resilience in the case of adaptation. A positive mitigation or enabler CIF shows the avoided GHG emissions in -tCO₂eq.

This outcome depends on a sensitivity assessment. CIF results can be Positive, Positive within limits, Unclear, Sensitive and Negative.

Significant

A CIF is significant when the project has a climate impact (positive or negative) greater than 5 tonnes of CO₂eq per year. This is roughly the global average annual CO₂ emissions per person, and the mass of a male African Elephant.

The threshold for significant impact can be set to a higher amount for a particular organisation or occasion. The result can be Significant or Marginal.

Impact story

An impact story is a summary of how a project makes a positive climate impact. It is written by the validating impact expert and contains the key impact data from the Climate Impact Forecast.

COOLING THE WORLD WITH INNOVATIVE CRYOGENICS

Cryostats are required in several fields of science and industry to reach extremely low (“cryogenic”) temperatures.

Especially the development of modern quantum technologies, such as quantum computers, advanced quantum sensors and a global quantum communication infrastructure requires fast and highly automatized testing at temperatures near-absolute zero. Most commonly such temperatures are reached by using cryogenic liquids, notably helium-4 and helium-3.

However poor availability of these rare element isotopes and cumbersome and slow handling of regular cryogenic equipment has caused expenses, maintenance, and down-times to increase and is already today one of the major bottlenecks of the development of modern quantum technologies and advances in low-temperature science.

Kiutra GmbH’s innovations in highly automatized magnetic refrigeration solve these issues, and importantly, decrease energy use and the associated carbon emissions. Compared to the regular cryogenic equipment out in the market today, kiutra can e.g. save up to 263% in energy use for a standard quick test (e.g. of 1 hour of testing time) at low temperatures and therefore limit use costs, but also carbon emissions by -8.5 t CO₂eq per year and device.

Kiutra’s cooling technology saves GHG emissions by being more energy efficient compared to regular cryogenic equipment, but also via highly automatized sample loading technology, which allows for easy-to-use, faster and less expensive testing at low temperatures.

Climate Impact Forecast and Validation result

kiutra provides cryostats with magnetic cooling instead of He3 based cooling technology. The difference in impact is calculated per year and the total impact of kiutra per year is calculated for 675 times a 1 hour test measurement at low temperature (e.g. at 100 mK).

Use | In the absence of conclusive LCA data for cooling media (e.g. FAA, He3/He4), core components (e.g. vacuum pumps, compressors, Cu:NbTi superconducting wire) and manufacturing processes used by kiutra and for the baseline cooling solution, respectively, we compare here only the GHG emission in the use phase. This approach seems however to be justified by the relatively long lifetime of the products of about 20 years and their relatively large power consumption of about 7.3 kW (Kiutra L-Type Rapid) or 8.6 kW (BlueFors LD-250) in the use phase, which presumably dominates the overall GHG emissions. The power consumption data was extracted from the product specification sheets, respectively, in a separate spreadsheet. The difference to the baseline solution and its impact for various testing times at low temperatures (e.g. 1 minute quick testing to 1 week long-term tests) has been analysed, in a separate spreadsheet. For the impact forecast model below, we assumed a typical testing time at low temperatures of about 1 hour per test in average and a typical operational time of about 300 days per year resulting in about 134 MJ per 1 hour test at low temperatures. According to our business plan, >6000 tCO₂eq of GHG emission can be potentially saved until 2030 using our cooling technology instead of regular cryogenic equipment.

Validation	By: Santeri Lehtonen, Started: Sun May 22 2022 18:27:31 CET, Completed: Sun May 22 2022 18:34:01 CET
Strong points	Very well constructed testing regime to show the difference in baseline technology and Kiutra LTR energy use. Auxiliary spreadsheet easy to follow.
Weak points	Supporting spreadsheet needed to verify result. Absence of production impact information - however, the assumption that Use phase dominates the impact is probably correct (low sensitivity to materials and production methods).
Sensitivity	Kiutra's impact is sensitive to the Use phase energy use savings, but as the delta has been proven experimentally, it can be said with good confidence that kiutra LTR devices will save significant energy and emissions over their lifetime.

Use

⚡ Electricity EU-27
0.09389 per MJ
134 MJ
-12.58

kiutra's total impact per year		Carbon footprint CO₂eq.
eco-costs of human health euro	-174.4	-12.58 kg
eco-costs of eco-toxicity euro	-506	
eco-costs of resource depletion euro	-985.1	-8.5t
eco-costs of carbon footprint euro	-1731	
	Impact per a 1 hour test measurement at low temperature (e.g. at 100 mK)	
	Impact of 675 times a 1 hour test measurement at low temperature (e.g. at 100 mK)	

VALID, POSITIVE AND SIGNIFICANT
Impact validation
All data and assumptions are approved

Equivalent to



386 trees

1 Average humans

1	9	16	4	2	2
times driving a car around the world	passengers flying London-New York	barrels of oil burnt	EU households annual electricity	elephants mass (5t) of CO ₂	hot air balloons (2800 m ³) of CO ₂

Validation quality mark can be checked on: www.impact-forecast.com

<p>validated in April 2022 validation id:</p> <p>SL415</p> <p>Verifyable at www.impact-forecast.com</p>	<p>KIUTRA GMBH</p> <p>Mitigates climate change with an impact reduction potential of:</p> <p>-8,5 tCO₂eq / year</p>	<p>Validity of forecast ■ Valid</p> <p>Impact compared to baseline ■ Positive</p> <p>Magnitude of impact ■ Significant</p>
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This validation is executed by a third-party validator commissioned by Impact Forecast. The project is part of the RACE program supported by EIT Climate KIC in collaboration with EIC.



More information

We help companies to know, show and grow their climate impact. More information about the validation process you can find on our website: www.impact-forecast.com

